In-beam γ-ray spectroscopy of ^{136}Te at relativistic energies†

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The reduced transition probability $B(E2; 0_1^+ \rightarrow 2_1^+)$ to the first excited 2^+ state of the neutron-rich nucleus ^{136}Te, with two protons and two neutrons outside the doubly-magic ^{132}Sn core, has been measured via Coulomb excitation at relativistic energies at the RIKEN Radioactive Isotope Beam Factory. A value of $B(E2) = 0.191(26)$ e^{2}b^2 was extracted from the measured inelastic scattering cross section on a Au target taking into account the contributions from both Coulomb and nuclear excitations. This value is compared to previous experimental results reported in the literature and various theoretical calculations in Fig. 1. Our measurement, performed at relativistic energies, agrees with the large value which has recently been obtained in Coulomb excitation at safe energies at Oak Ridge.[1)] It is, however, in conflict with the low-energy Coulomb excitation measurement of Refs. 2–3) and the preliminary result of the experiment using the fast timing technique reported by Fraile *et al.*[4)] For a detailed discussion of the comparison to theory we refer the reader to the original publication.

The high statistics gathered in the present experiment allowed for the first time to evaluate in detail the validity of the approach employed in the analysis of Coulomb excitation experiments at beam energies around 150 MeV/nucleon and to estimate the systematic uncertainties involved in the different steps of the analysis. In this publication, a detailed discussion of the analysis procedure is provided so that it can serve as guideline for the analysis of future experiments using the same technique but accumulating less statistics. In particular, the correct determination of the exclusive scattering cross section to the 2_1^+ state, taking into account the scattering-angle dependent losses due to the limited acceptance of the ZeroDegree spectrometer and losses due to reactions which take place on any material in the beam line between the identifications in BigRIPS and the ZeroDegree spectrometer, is discussed in detail. The other important part of the analysis concerns the determination of a $B(E2)$ value from the measured exclusive cross section, which requires a consistent description of both nuclear and electromagnetic excitations. In the present case, the code FRESCO[5,6)] was employed for this purpose.

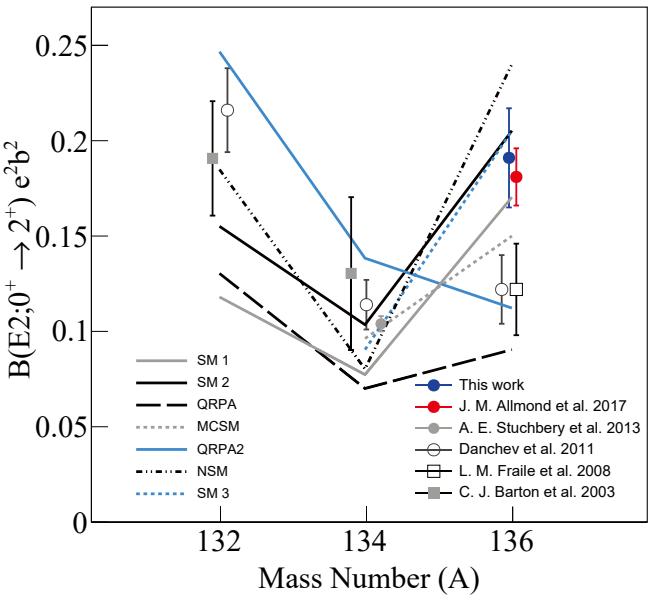

Fig. 1. Comparison of the experimental $B(E2; 0_1^+ \rightarrow 2_1^+)$ value for ^{136}Te determined in the present work to literature values for the $^{132, 134, 136}$Te isotopes and different theoretical calculations (for details see the original publication).

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